REMARKS

INTRODUCTION:

In accordance with the foregoing, claims 4 and 5 have been canceled without prejudice or disclaimer, claims 1, 3, and 6 have been amended. No new matter is being presented, and approval and entry are respectfully requested.

Claims 1, 3 and 6-11 are pending and under consideration. Reconsideration is respectfully requested.

EXAMINER'S INTERVIEW:

On November 2, 2006, Nicholas DeCristofaro (inventor), Shinya Myojin (inventor), and Darleen J. Stockley (applicants' attorney) met with Examiner Sikyin Ip and discussed an exhibit (US Patent Application 10/644,220, Copper-Nickel-Silicon Two Phase Quench Substrate, Claim 1...) and arguments regarding claims 1 and 6. Applicants thank Examiner Sikyin Ip for his time and consideration.

CHANGES TO THE CLAIMS IN VIEW OF EXAMINER'S INTERVIEW:

To further prosecution of the present application, the above amendments for claims 1, 3 and 6 are submitted. Claims 4 and 5 have been canceled without prejudice or disclaimer.

In addition, the following comments are set forth to elucidate differences between the present invention and the cited references.

1. Conventional alloys

Cu-Ni-Si-Cr alloys are typically available in cast and wrought forms. In either form, the microstructure consists of relatively ductile copper rich cells and relatively brittle nickel-silicon and chromium-silicon precipitates. The relative sizes and shapes of these phases determine the mechanical properties of the material.

1.1 Cast Cu-Ni-Si-Cr

In the cast form, the Cu-Ni-Si-Cr alloy exhibits a microstructure characterized by copper rich cells surrounded by near-continuous networks of nickel-silicide and chromium-silicide particles. Smaller nickel-silicide and chromium-silicide particles may also be present within the copper rich cells. The cast alloy may exhibit a microstructure characterized by cells in the form of large, columnar grains with aspect ratios much greater than 1 (see Figure 1a). The cells

illustrated in Figure 1a are ~100 mm in length (100,000 μm) and ~20 mm wide (20,000 μm), creating an aspect ratio of ~5. Alternately, the cells in the cast form may be smaller and exhibit an aspect ratio closer to 1 (see Figure 1b). However, even the smallest cells shown in Figure 1b are over 1 mm (1,000 μm) in diameter.

Figure 1a

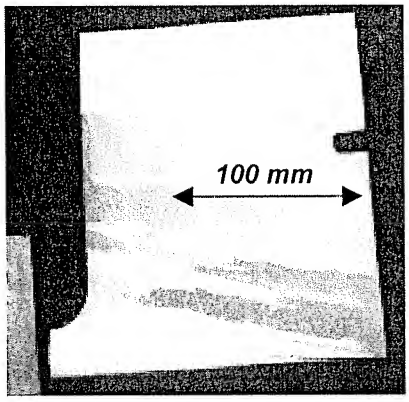
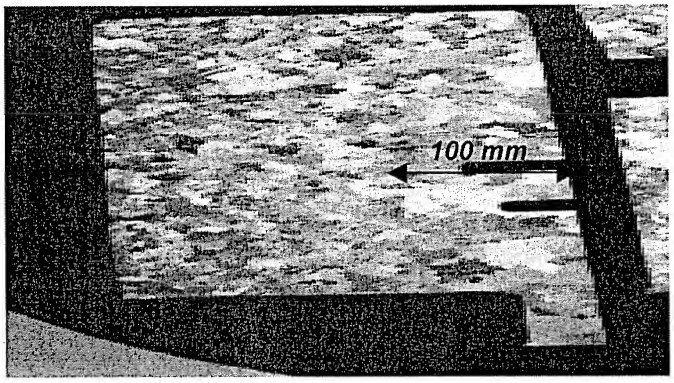


Figure 1b



1.2 Wrought Cu-Ni-Si-Cr

In wrought Cu-Ni-Si-Cr alloys, mechanical forces (rolling, forging, extruding) are used to break down the large copper rich cell size and disrupt the near-continuous network of nickel-silicide and chromium-silicide at the cell boundaries present in cast alloys. An example of a wrought Cu-Ni-Si-Cr alloy is shown in Figure 2a. Note that the cell size is reduced to about 0.1 mm (100 μm). While the nickel-silicide (dark grey) and chromium-silicide (black) phases no longer completely encircle the copper rich cells, the silicides still cover substantial fractions of many grain boundaries. These silicides are still large (50 μm x 5 μm) and elongated (very large aspect ratios >5). The extent of the nickel-silicide and chromium-silicide coverage of the copper cell boundary is significant in that cracks in wrought Cu-Ni-Si-Cr alloys tend to propagate through these elongated silicide particles (Figure 2b).

Figure 2a

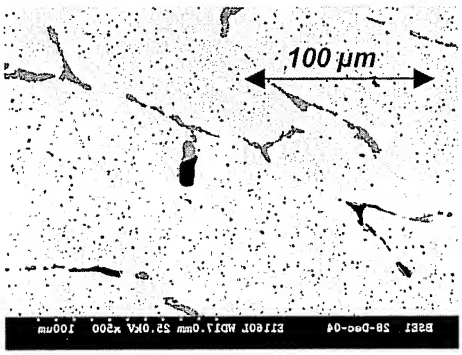
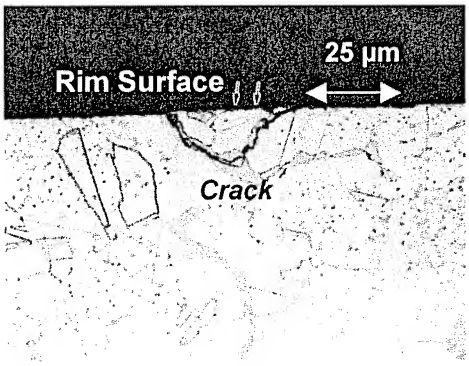


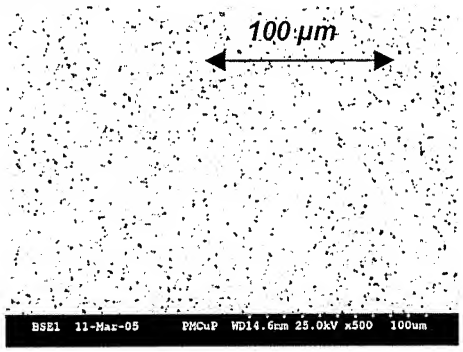
Figure 2b



2.0 Present Invention as Taught by 1789.1040

Cu-Ni-Si-Cr alloys, as taught by the present invention, have been cast, wrought and/or heat treated to eliminate the large, elongated nickel-silicide and chromium-silicide particles present in conventional wrought versions of this alloy. Examples of the microstructures present in Cu-Ni-Cr-Si alloys of the invention are shown in Figures 3a, 3b and 3c. The images of Figures 2a and 3a are identically magnified. It is immediately apparent that the large, elongated silicides at the copper rich cell boundaries present in Figure 2a are eliminated in the structure illustrated in Figure 3a. All the silicides in the alloy taught by the present invention are small and spherical.

Figure 3a



Higher magnification images of two examples of microstructures taught by the present invention are shown in Figures 3b and 3c. These materials have different heat treatments.

Figure 3b

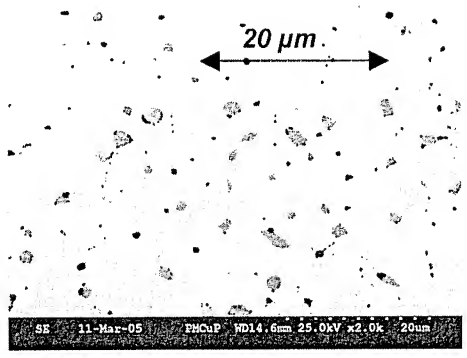
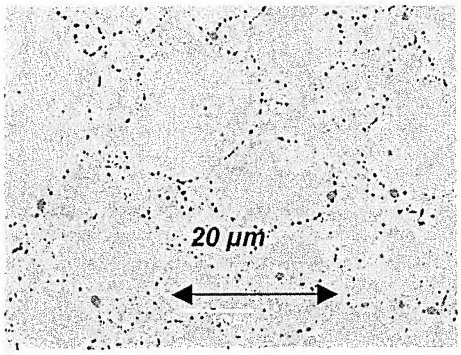


Figure 3c



The structure illustrated in Figure 3b is comprised of copper rich cells approximately 20 µm in diameter with an aspect ratio of about 1. The nickel-silicide (dark grey) and chromium-silicide (black) particles are 5µm in diameter or smaller, have an aspect ratio of about 1, and are uniformly distributed. Some of these silicides are located at the copper rich cell boundaries. However, like the silicides within the copper rich cells, the silicides at the cell boundaries are small, spherical and discrete particles.

The structure shown in Figure 3c concentrates the visible nickel-silicide and chromium-silicide particles at the copper rich cell boundaries (note: silicides less than 0.5 µm in diameter are present within the copper rich cells, but are not visible at this magnification). While the visible silicide particles decorate much of the cell boundary, the individual particles are small (<2 µm diameter), spherical (aspect ratio of 1) and discrete (not connected).

Hence, claims 1, 3, and 6-11 are now submitted to be in form for allowance.

CONCLUSION:

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot, and further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited by the Examiner contacting the undersigned attorney for a telephone interview to discuss resolution of such issues.

If there are any underpayments or overpayments of fees associated with the filing of this Amendment, please charge and/or credit the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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